Fall 9-1-2000

MATH 581.01: Combinatorics

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Course: Math 581 Sec. 01 (CRN 71884) 3 cr., Fall 2000
Combinatorics
MWF 2:10–3:00pm in MA 211

Instructor: Mark Kayll
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http://www.math.umt.edu/~kayll/

Office: MA 7B
406.243.2403 (w/voice mail)

Hours: MT 8:40–10am, W 9:40–10:30am, or by appointment MTWF (avoid Thurs. please).

Prerequisites: students should have background appropriate for graduate-level study of mathematics; combinatorial ideas will be introduced as needed. No specific combinatorial background will be assumed.


Important Dates: Mathematics Colloquium: Professor John Horton Conway, Princeton University
The Mysterious Arithmetic of Integral Lexicographic Codes
Thur., 7 Sept. at 4:10pm in James E. Todd Building 203–204 (attend. mand.);
President’s Lecture: Professor John Horton Conway, Princeton University
Making Knots Dance: The Fascinating Mathematics of Ravelled Ropes
Thur., 7 Sept. at 8:00pm in the University Theatre (attendance mandatory);
last day to add/drop by Dial Bear Monday, 25 September;
last day to drop (no $$ back) Monday, 16 October;
Veterans’ Day Holiday Friday, 10 November;
Thanksgiving vacation 22–24 November;
Final class meeting Wednesday, 20 December 1:10–3:10pm (during final exam week).

Description: This will be an introduction to and survey of combinatorics at the graduate level. Concepts will be introduced from scratch but considered in some depth. Combinatorics is a subject that offers easily stated problems, the solutions of which often lead one to delve into a myriad of “mathematical tool boxes”. One who studies the subject is thus afforded the opportunity to learn about many branches of mathematics. Students seeking thesis problems might wish to consider that combinatorics is also a very active field of research.

Topics will be selected from the following (non-exhaustive) list: extremal set theory, Ramsey theory, combinatorial designs, error-correcting codes, graph colorings, matching theory, partially ordered sets, correlation inequalities (e.g. the “four functions theorem"), infinite combinatorics.

Assessment: Grades will be based on performance on homework and a presentation. I reserve the right to include up to two take-home tests to be counted as part of the HW weight (see below). There will be zero in-class tests.
**Homework** Assignments will be set regularly on a (roughly) fortnightly basis, according to the following routine. A list of problems will be distributed. A week or so later, a subset of the problems will be specified as the “hand-in” set, to be collected within a few days of the specification date. You should plan to work on all the problems, but need only write careful solutions for the ones you submit.

**Presentations** Each presentation will consist of a one-hour lecture scheduled during a regular, or final, class meeting. The content of the presentations should be related to the course content and may be inspired by one or more sections of the text, by related paper(s), or by other related material. Students should schedule their lecture date privately with the instructor early in the semester; time slots will be assigned on a first come, first served basis.

Lecture topics must be approved by the instructor, and students should take the following steps in preparation for their lecture.

<table>
<thead>
<tr>
<th>Step</th>
<th>Timing</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>early in semester</td>
<td>Schedule lecture date with instructor.</td>
</tr>
<tr>
<td>1</td>
<td>3 weeks prior to lecture date</td>
<td>Submit a $\leq$ 1-page typed summary proposal of lecture topic, with references.</td>
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<tr>
<td>2</td>
<td>2 weeks prior to lecture date</td>
<td>Receive approval of proposal or suggested modifications from instructor.</td>
</tr>
<tr>
<td>3</td>
<td>1 week prior to lecture date</td>
<td>Meet with instructor privately for final informal discussion of lecture topic; be prepared to field questions on your topic.</td>
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The following weights will be used to determine course grades:

- Homework/take-home tests 70%;
- Presentation 30%.

**General Remarks**

**On homework:** Please use complete sentences, proofread, and polish your work prior to submission. You are encouraged to type HW solutions unless your handwriting is very clear. You may work with others on HW problems, and you are encouraged to do so. **Solutions should be written down privately in your own words.** If you use an important idea of someone else, then please acknowledge that person by giving an appropriate citation in your write-up. I will require that homework be typed if these guidelines are not followed.

**On deadlines:** Any stated deadlines will be firm; please do not ask for extensions.

**Additional References**

